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ABSTRACT

This guide is linked to a science curriculum and was designed for use by those involved with early childhood education. The goal of this document is to enable caregivers and teachers to use the curriculum in a more varied, stimulating, and developmentally appropriate way. Topics discussed include student attitudes toward mathematics, parent education, learning through play, the language of mathematics, mathematical concepts, and mathematics and science. (DDR)

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Maths and Science Booklet:

A Practical Guide

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Series of Caribbean Volunteer Publications

#6

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MATHS
and
SCIENCE

: A practical guide to help with planning your

Early Childhood Programme

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Anne Watkins, V.S.O.

Grenada, Carriacou and Petit Martinique, 1996.

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Introduction.

This document has been produced to assist all those who are involved in the care and education of young children in Grenada, Carriacou and Petit Martinique.

The Ministries of Social Services and Education produce Early Childhood Curriculum Guidelines which are based on the thematic approach.

This production must be viewed, therefore, mainly as a supplement to be used along with "Language and Learning" and the existing Curriculum. It is written as a practical working document which will hopefully enable caregivers and teachers to present the Curriculum in a more varied, stimulating and developmentally appropriate way.

Our responsibilities as early childhood carers and educators are enormous, and although the roles are separated here; it is important to remember that they are in fact inseparable. As UNICEF states in their booklet on Early Childhood Development **"Children cannot be well cared for without their being educated, and children cannot be well educated without their being cared for."**

This view of the **'whole'** child is one that we need to constantly bear in mind. Knowing that children progress at different rates from each other, and may well progress at a different pace in various areas of the Curriculum 'Starting with Quality' recommends that, **"Progression should not be seen purely in terms of intellectual competence but in wider respects including health, social and emotional development."**

Section 1.

Attitudes to Maths

For many adults mathematics is associated with anxiety, confusion and failure. However, for young children it is a fascinating area which they see as an integral part of the rich experience of life.

Their world is not divided into subject headings, and they quite naturally approach mathematical ideas and concepts, as indeed all subjects, with enthusiasm, curiosity and wonder. All of which are key elements in learning which help children to find out about the world around them.

One of the main aims of maths is to encourage children to think critically, reason and solve problems.

Solving problems is something that we do all our lives. Children need to be given time to **think for themselves**, and to **try out their ideas.** This also encourages concentration, and as children mature in their preschool years, to complete a task is very important.

Children's attitudes to all areas of learning are affected by their view of themselves.

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Individual differences need to be taken into account and children allowed to progress at their own rate. 'Early Childhood Education' states that, **"What children can do not what they cannot do is the starting point of children's education."**

Research shows us that children learn when they are developmentally ready. Also, that they learn better, and develop a deeper understanding of maths concepts when they use **concrete or 'hands on' objects**.

Children need to see a relevance and purpose for their learning. We as early childhood educators need to think of situations and experiences which have a **real purpose.** It may be going on a shopping trip to buy items for e.g. An Independence day treat where the children - choose and count the number of items, make a shopping list, handle money, accept change, etc.

These activities help children not only to learn about maths concepts, but **how maths relates to everyday life.** The shopping trip will teach children the importance of money, quantity, number, making sure everyone has a share, dividing things out, etc.

These and other everyday activities help children a lot. They will learn to understand the importance of time as they wait for biscuits to come out of the oven.

The importance of number as they count out pencils for each child.

Also an early exposure to fractions as they see an orange cut in halves or quarters at snack time.

Children who experience maths in a meaningful way and as an integral part of everyday life are much more likely to develop positive attitudes towards it.

There is sometimes concern that girls show less interest in maths than boys, that they tend, if given a free choice to usually choose the Home area rather than blocks or sand play.

This can be a reflection of attitudes learnt at home and this is an area that needs addressing in our Parent Education programme.

It is important that not only is play valued but the importance of e.g. boys and girls both playing with dolls and cars is brought to the parents attention.

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Section 2.

Parent Education

An excerpt from a letter written to a parent, from a teacher, by Leila P. Fagg.

Play To-day?

You're asking me the value
Of blocks and other such play?
Your children are solving problems
They will use that skill every day.
You're asking what's the value
Of having your children play?
Your daughters creating a tower;
She may be a builder someday.
You're saying you don't want your son
To play in that "sissy" way?
He's learning to cuddle a doll?
He may be a father someday.

As this poem indicates not all parents understand the importance of what we do at Day Care and Preschool. The fact that children learn while they are playing is not always understood or valued.

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We have a very important role as early childhood educators to help parents, as well as the wider community to understand **how** young children learn and to explain **why** children are engaged in certain activities.

Children come to us already rich in knowledge and experience.

To build upon this learning there needs to be **two way** communication between parents and teachers. The process needs to be seen as an **ongoing partnership.**

Parents and Community members can be invited to share particular activities e.g. an excursion, a cooking activity, a special craft activity for Easter, etc.

Charts can be made and put up near the door suggesting ways that visitors can help e.g.:-

Home Area

When playing in the Home Area with the children talk about:-

Families:- brothers, sisters, etc.

Clothes:- sizes, shapes, patterns, etc.

Equipment:- table - long, short etc.

Utensils:- cups - big, small, etc. etc....

Charts can also be put up to inform visitors what children are learning in various areas e.g.:-

When children are playing with blocks they learn about:-

Measuring and balance.

Making a plan.

How **many** blocks.

How **long** their road is.

How **tall** their tower is.

etc. etc…

Some adults may feel more secure if they have a specific job to do e.g. reading to a small group or responsible for the care of a group on an excursion.

Be sure to prepare your helpers so they know your aims. e.g.:-

Why are you taking the children to visit the shop?

- to look at fruits and vegetables?
- to see the role of the shopkeeper?
- to buy some vegetables to make soup?
- to look at the use of money? etc.

That way helpers can be useful and feel involved.

Parent meetings allow a slightly more formal venue to inform parents about what we are doing.

They should be seen not only as a place to organise fund raising events, to talk about possible changes to the school uniform etc. but, as a means of educating our parents.

Inform parents about how maths and other subjects are taught in your class.

- **Why children sort things into boxes.**
- **How shapes are experienced as children build with blocks.**
- **How volume is explored in water play etc.**

Many ordinary everyday events provide early opportunities for children to learn to count and use mathematical symbols e.g. counting steps with a toddler, sharing out food etc. **However,** this relies upon the quality of **interaction.**

The importance of spending time with children and allowing them to talk, discuss, express ideas, feelings and thoughts need to be stressed very much with parents.

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Encourage parents to help their children at home. Talk about and show specific ways:-

Have a special parent 'make and take' session one afternoon.

- make simple jigsaw puzzles out of old birthday or Christmas cards.

Explain to parents that puzzles are very good as they require children to match, order and fit shapes together as well as encouraging their visual discrimination.

Display charts of ideas for sorting, matching and counting at home with everyday objects e.g..:-

Help your child at home

Allow your child to:-

Lay the table ,count the cutlery etc.

Sort the socks into pairs

- babies

Sort out the clothes - Daddy's

etc. etc.

Section 3.

Learning through play

It is **play** that links together the different areas of the Early Years Curriculum.

As a child designs and builds a house or vehicle with boxes or blocks:-

- he is engaged in **maths** by using shapes,
- **science** by investigating different mediums,
- and **technology** by creating a design.

Day Care and Preschool need to be comfortable, safe, happy places where children are **free to learn**.

As we have already stated early childhood educators play a critical role in young children's learning. 'Starting with Quality' reminds us that "**It is within their power to encourage feelings of fun and discovery in learning on the one hand, or of dull drudgery on the other.**"

Think about your Day Care Nursery or Preschool classroom. Is it one of fun and discovery? Are your children **learning through play**?

The type of **play** we are talking about here is not the **'free' play** enjoyed outside at break time. Although, children learn many things during this time e.g.:-

- socialisation skills (learning to play and co-operate with friends).

- independence and responsibility (opening drink bottles, putting rubbish in the bin) etc.

There is a time and place for this type of play. However, the type of play we are talking about is **'guided'** or **'structured' play** where the teacher has carefully planned the activity e.g.:-

- **A Science or Discovery table** with magnets or rocks etc.
- **A Shop or Office area** with play money, bags, boxes, scales, calculator, pencils, note pads etc. that she knows the children will learn from.

Children will interact and learn not only from the materials provided but also from each other. **However**, some of the most valuable learning comes from **teacher observation and interaction**.

If you feel it is appropriate you can guide the play in a certain way e.g. sit down with the children and model being a shopkeeper, model appropriate words

e.g. Good morning, may I help you?, we have soursop today, we lave **large** cabbages, **small** tomatoes, sweet potatoes $2 a pound, etc.

There is a time also for **free discovery** e.g. when magnets or magnifying glasses are first introduced. Children need time to experiment to see what they can do.

Then teachers can interact by providing further materials, appropriate words, activities, books etc.

In the stages of development of a young child there are different types of play and we need to be aware of these.

- Babies can be seen in practice and manipulative play where they repeat activities over and over again e.g. putting things in their mouth, throwing their spoon on the floor, etc. This type of play is **solitary** (playing alone) or **parallel** (beside another child).

- As children mature in their Preschool years they are beginning to want to help and socialise and **co-operative** play becomes much more evident.

Section 4.

The language of maths

Language development is as we know vitally important and the development of mathematical language is an essential part of learning.

However, words cannot be a substitute for actually doing things and interacting with real objects by using all the senses.

Maths words need to be reinforced in **many** different situations. This way you as the teacher will know that the **concept behind the word**, not just the word itself is really understood.

These concepts can be practised in many different situations, not just in your maths lessons e.g.:-

- **in and out**, during the singing of 'Mr. Frog' song outside at physical education time.

- **full and empty**, during water play time with various sizes and shapes of containers.

- **on top of and underneath**, during language time when identifying names on a chart.

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It is good also to introduce the use of specifically correct terms.

Children for example will often use the word **big** to describe measurement of all kinds. They can be encouraged to use the correct terms by you as the teacher saying about a block wall they made:-

Your wall is very **long**,or about a tower:-

Your building is very **tall**.

A variety of number sequences can also be introduced not just:-

one, two, three but

first, second, third and

first and last, etc.

Pictures can be used to illustrate this e.g. people sitting on a bus:-

The **first** man is reading a book,

The **second** man is looking out of the window etc.

Using the children themselves makes the learning meaningful:-

- Ask the children to stand in a line, say who is **first** etc. who is **last**.
- Who is **next** for a turn etc. Sports days are an excellent time to reinforce these concepts.

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Different areas of the room allow for the learning and understanding of important mathematical words e.g.:-

Block Play - heavy, light, tall, short, taller than (comparing) long, longer, longest, etc.

Collage - on top, beside, between, beneath, etc.

Specific activities such as a feely box with **rough** and **smooth** objects inside is also a good way to reinforce words.

A sorting activity from objects collected on a walk allows children to also learn new words in a fun way e.g. seeds - **light/dark**.
leaves - **big/small**.
stones - **rough/smooth**.

Be aware constantly of your 'teacher talk,' making the most of every language learning situation. Introduce new words, develop vocabulary, reinforce and enhance meaning. Encourage the children to comment, discuss, offer suggestions, opinions, thoughts, feelings, etc.

Section 5.

Maths concepts

When children are learning new concepts and skills, the foundations need to be securely built.

Well planned activities and experiences at the Day Care and Preschool levels help to build on the foundation of mathematical ideas which have begun at home.

If young children have been talked to and encouraged at home and understand e.g. about the concept **big and small** they will be much more ready to learn about the properties of numbers. These concepts will be developed as children mature and progress through School.

The foundations need to be strong and secure and if mathematical concepts are not learnt in the **correct sequence** the building will crumble and children will very quickly develop feelings of confusion and failure where maths is concerned, or indeed in all areas of learning. A barrier is put up which often persists into the adult years and is very difficult to overcome.

Young children need to fully understand one step before being moved onto the next.

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Conservation.

One of the early concepts that young children need to learn about is conservation.

When we say that children **"know their numbers"** it usually means that they can recite 'parrot fashion' the names of them from 1-5, 1-10, or maybe beyond.

*IMPORTANT NOTE

The learning of numbers is not the first most important stage. An exposure to, and experience with, a variety of materials to sort, match, group and learn about it much more important.

Invariably at the early stages there is no real understanding of what the numeral words actually mean or how they relate to one another.

Real objects which can be seen and handled need to be used before a child can understand numbers for things that cannot be seen e.g. 3 miles, 3 years old etc.

e.g. Five buttons are much easier to count that a picture of five buttons.

A variety of activities need to be used to introduce and teach a concept. NOT JUST ONE

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Children learn in a variety of ways and especially with very young children practical body movements and 'hands on' interactions need to be experienced.

- draw 3 circles with chalk on the floor, indoors or out. Jump in and out of them, counting as you jump.

- play with 3 balls or hoops or bean bags, draw a picture of them.

- make buildings with 3 blocks, use large and small ones.

- write numbers on plastic bottles 1,2,3 - use as skittles, count how many knocked-down, how many standing etc.

- sing the song 3 blind mice, make finger, hand or paper bag puppets of them.

- tell the story of the 3 bears, make masks of the characters, act out the story.

- help the children find two friends to make a group of 3.

- draw a number 3 on the floor, have 3 children stand on it.

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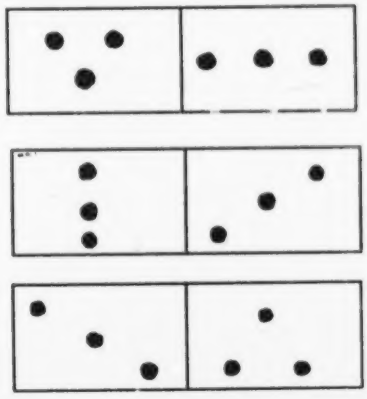
Children need to learn that 3 is <u>always</u> 3 no matter how it is presented or arranged.

As the children mature and begin to play card games such as dominoes, snap, concentration, etc. where you may be presenting a number of dots. Make sure that you represent the numbers e.g. 3 in a variety of combinations so that the children come to understand this concept.

dominoes:-



<u>Remember</u>, learning can take place anywhere, maths learning need not only be sitting at a table, use:-

<u>The Home area</u> - counting, matching cups and saucers, talking about big and small saucepans etc.

<u>The Shop area</u> - money, size, quantity, space etc.

<u>The Water area</u> - floating, sinking, things that absorb water etc.

<u>The Sand area</u> - heavy, light, etc.

Make use of the outdoor environment, it is rich in opportunities for maths learning.

- A short walk away from school can offer much e.g. look at the shape, colour and size of houses, windows, doors, roofs.
- The way numbers are used can be seen on signs, houses, cars, buses, etc.
- Looking at the dimensions of roads, walls, etc. can give opportunities for using spatial vocabulary etc.

As well as number you will see other maths concepts are also being introduced such as simple addition and subtraction, space, shape, 1 to 1 correspondence, etc.

1 to 1 Correspondence.

1 to 1 correspondence is another early concept which children gradually acquire with maturity, however, this needs much practise so that the concept becomes clear.

Matching a single number to a single object requires maturity and concentration.

Young children can often be seen skipping over objects or counting the same object twice.

Many everyday activities are needed to reinforce this concept e.g.

- matching buttons to button holes.
- putting pegs in holes.
- lids on jars etc.

1. MATCHING, SORTING, CLASSIFYING.

There is a certain amount of overlapping when we talk about the areas of matching, sorting and classifying.

MATCHING.

Things which are the same can be matched with one another. Being able to tell whether things are the same or different is a very important concept.

When children learn to read and write they need to be able to see the small differences between letters and numbers.

When matching at the very early stages with children be aware that a difference in e.g. the shade of red between two blocks may confuse some children.

They also need to gradually become aware that the object is still red whether it is a cube, circle or fire engine.

Special colour tables in your room can help reinforce this concept. Children can bring things in from home to put on e.g. "Our red table" such as a red cup, a red ribbon, a red toy car, a red sock etc. A red cloth on the table will enhance the display or a group of the children's red finger paintings on the wall behind.

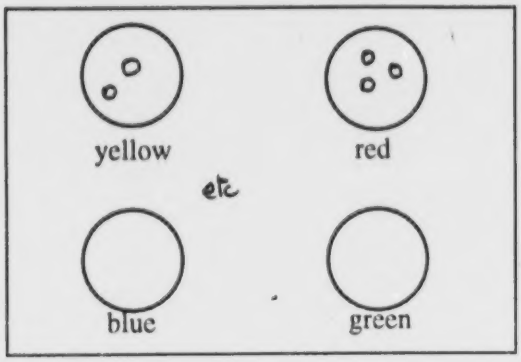
Children need to learn colours in a variety of ways.

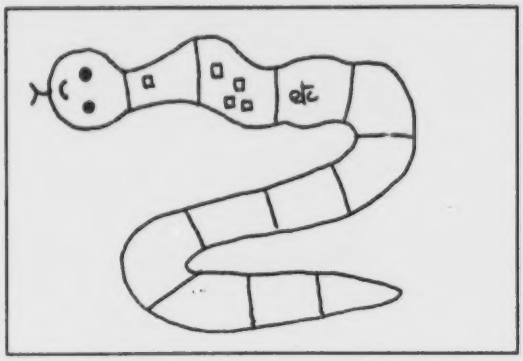
From everyday objects, clothes, buildings, household equipment, etc. Constantly naming colours at 'tidy up' and 'snack' time e.g.

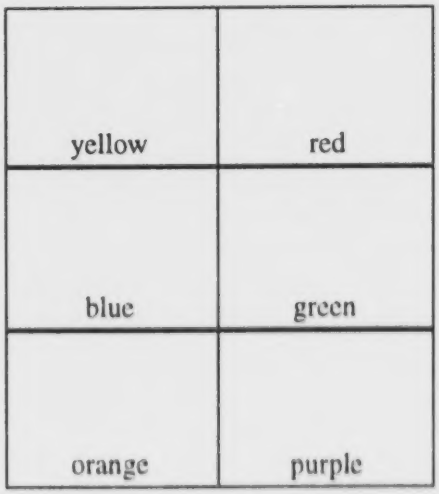
"Bring me the red box please for the blocks"

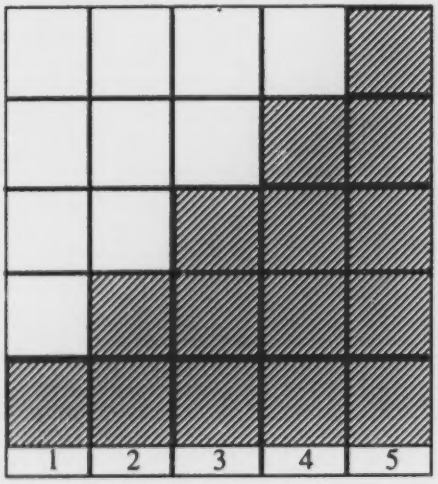
"I like your new yellow lunch kit."

Various colour matching and sorting games can also be made e.g:-









Counters, bottle tops, small blocks, dice and spinners can be used.

SORTING.

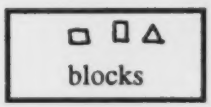
Things which are different can be sorted into sets. A set is a group of things which has something in common e.g. colour, shape.

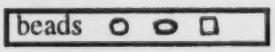
Children are learning important discrimination skills when they are sorting and matching.

Helping to tidy up at the end of the day or session can be a very good sorting activity in itself e.g. putting wooden blocks, plastic beads, collage materials into their appropriate containers.

A silhouette shape or picture on the container will help children, as well as the appropriate word to introduce early exposure to print.

e.g:-





Build up a collection of small sorting objects labelled in separate containers, these are useful for many activities. Use containers with good fitting lids for seeds, peas etc. so as not to attract ants, rats or cockroaches.

Sorting objects can be natural or man made e.g. seeds, shells, stones, leaves, sticks, flowers, nutmegs, beans, bottle tops, pegs, beads, etc.

CLASSIFYING.

Allowing children to sort items according to certain criteria gives children good experience. Items are matched which are the same and put into different groups according to maybe size, shape, colour, feel etc.

Many different ways can be encouraged e.g. a large bag of shells can be classified according to dark or light, shiny or dull, rough or smooth, large or small etc.

These can also be made into an Experience Chart (see Language and Learning booklet page 56).

Your Notes

2. NUMBER

After much practise and experience with sorting, matching etc. and **informal** exposure to simple number concepts you will recognise which children are developmentally ready to move on.

Children as we have already discussed will learn the names of numbers quite readily.

To help in the **visual** recognition of numerals a clear number track displayed at **child height** is very useful:-

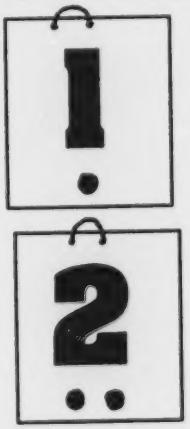
1 2 3 4 etc.

Children find it easier to recognise numerals in this way and it also encourages left to right progression.

A standard piece of Bristol board made into a number chart is much more difficult for young children to decipher e.g.:-

1 2 3 4 5
6 7 8 9 10

Number cards made into a display are also useful. **However, charts can never take the place of real objects which children can interact with, manipulate and move around, therefore enabling a real understanding of the concept of number.**



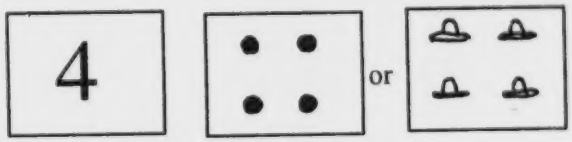
Counting is much easier and more interesting if **real** objects, especially those the children have collected themselves are used e.g. shells, small stones, seeds, leaves etc.

These can be arranged in sets, **however, be aware that young children have trouble counting sets that are arranged randomly**

e.g.:- hard to count. easy to count.

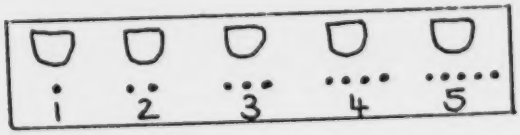
More structured counting games can also be made from 'junk' materials such as boxes, chubby bottles, card etc.

- matching cards e.g.:- using dots or pictures



These can also be used for snap, dice, concentration games, etc.

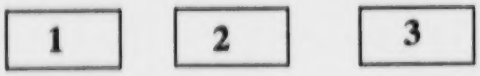
- sorting games e.g.:- using egg box sections, cut down chubby bottles or toilet rolls with counters, seeds or bottle tops.



Display numerals and dots whenever possible so that children who have not reached the stage of recognizing numerals can count the dots.

Arranging things in order helps children to think about sequence. They see how things follow each other in a specific way.

Simple pictures of a story can be put in sequence or

Numeral cards:- 

etc.

Dots cards:- etc.

Or actual objects such as a variety of cardboard rolls or plastic bottles in order of size e.g.:-

Counting songs and rhymes.

Counting down rhymes like 5 currant buns or 5 little ducks give useful, enjoyable practise in remembering the order of numbers. If objects such as flannelgraph (felt board) pieces, real objects or the children themselves are used to represent the five, with one disappearing or sitting down at the end of each verse it will help the children understand how the numbers relate to individual objects.

There are a number of practical ways to depict things e.g.:-

10 green bottles:- chubby bottles covered with green paper.

2 little dicky birds:- face masks for the children to wear.

5 naughty monkeys: hand and finger puppets.

<u>Counting with fingers is also good, they are practical objects in themselves</u>.

To encourage early literacy and numeracy a chart of familiar number songs can be made for your Centre e.g.:-

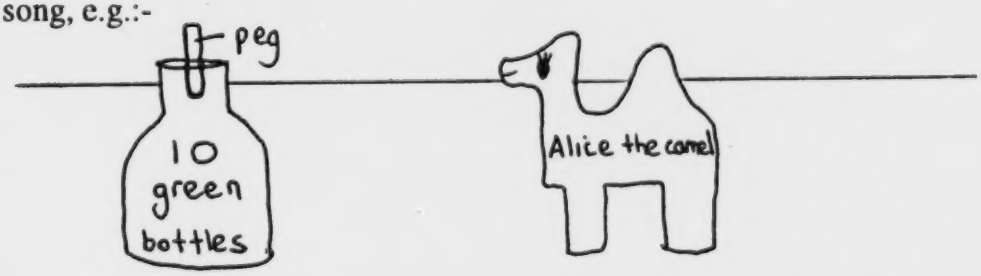
<u>Our number songs</u>.

5 little ducks

2 little dicky birds

etc.

A line can also be strung up and songs to be chosen represented by the labelled object. Children can point to these and name them when choosing a particular song, e.g.:-



Situations can also be created where number writing is necessary, e.g.:-

- how many people waiting to see the Doctor in the Hospital area.
- a message pad by the telephone in the Home area.
- for mature children, a score board by the skittles game.

Provide note pads and pencils frequently, in as many areas as you can.

Your Notes

3. MEASUREMENT .

Children will be exposed to many different forms of measuring as they play with a variety of materials.

We as educators however, need to be aware of the potential in each situation and ensure that children have experience with a wide variety of materials, many of which can be natural.

Sand and water are particularly useful mediums for learning about measurement and these need to be capitalised on in our learning programme.

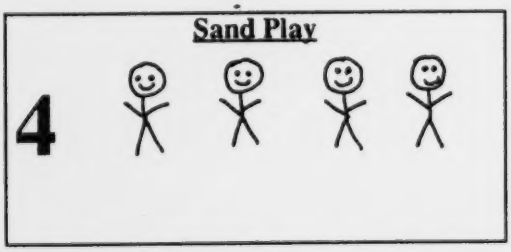
Maybe it will be more practical for you to allocate a space outside for this.

A small number of children can be given the responsibility to work in this area. It could be offered as a choice when children move around activities e.g. blocks, home area.

It needs to be carefully monitored and rules established before hand e.g.:-

Four children at a time.

A notice could be put on the wall to reinforce this and develop literacy skills.



Acceptable codes of behaviour would need to be discussed with the whole group e.g. If the sand is thrown, it goes in your hair and is uncomfortable. **Hats could be provided especially for this activity.**

Children will discover volume, capacity and weight as they play with water, dry and wet sand.

A variety of containers help with this learning process e.g. lids of spray cans, cut down shampoo bottles, plastic cups, bottles, bowls, different sized spoons, sieves, etc.

Children learn about volume and capacity by emptying and refilling containers of various shapes and sizes in the sand and water tray.

Encourage children to experiment by filling a large container with a small one **and** a small one with a large one to see what happens.

Help children to express their observations by using the correct language with them e.g.:- FULL, EMPTY, HALF, OVERFLOW, SLOW, FAST, HEAVY, etc.

At the very early stage the experience alone of a different medium, texture, smell are valuable learning experiences preparing children for future maths learning.

Other areas of the environment where this early maths is especially valuable and relevant, particularly in the area of measurement are the **Outdoor, Cooking, Home, Collage and Block areas.**

Here the concepts of **height, length, width, depth, quantity, sequence, size distance, direction** are all used in a practical way.

Two important concepts which children come to understand as they mature in their Preschool years are the areas of:-

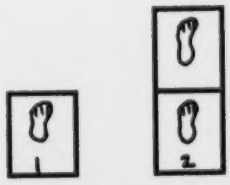
estimating and predicting e.g.:-

- **how many** blocks will they need to complete a house.
- **how large** a piece of dough will they need to make a man.
- **how small** a pot will they need for the seedlings
- **how much** water will they need to fill the vase.

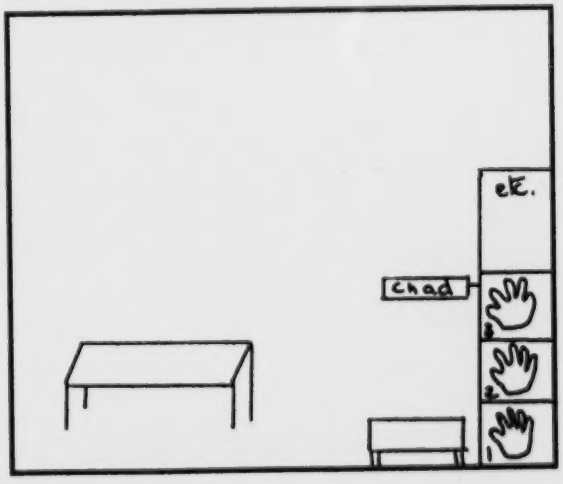
Children in their Preschool years are usually not ready for a standard form of measurement e.g. a ruler. However, a non-standard form can be used.

A variety of non-standard rulers can be made using e.g. footprints on thick card to measure a block building.

Different lengths can be made e.g.



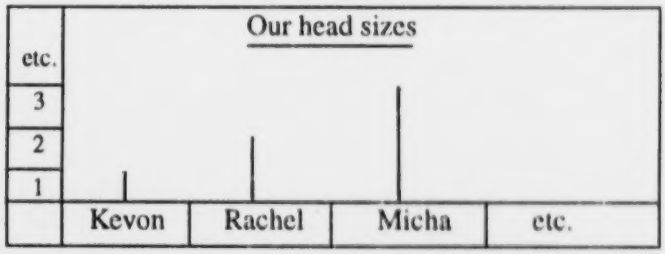
A non-standard height chart can also be made using e.g. hand prints and put in a row going up from the floor to measure children against e.g.:-



Measuring things to fit is another useful concept for children to acquire. This can be introduced through e.g. your craft activities by maybe making caps for the Child Month March.

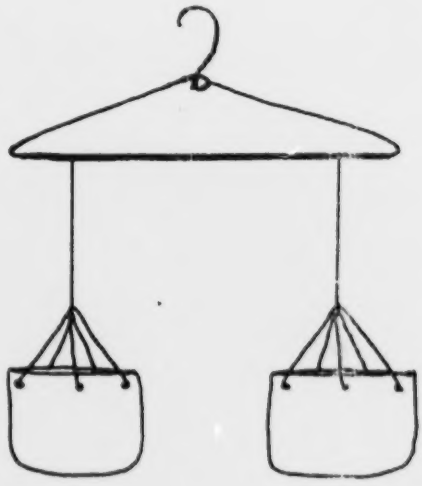
Place wool or string around the children's foreheads and cut to the right length. The children then stretch this out and use it to measure on a piece of Bristol board.

The discarded string can also be used to make a graph of children's head sizes. Try ordering these from smallest to largest e.g:-



Practical aids such as home made 'junk' scales can be made from cut down plastic bottles, a wire coat hanger and string.

Children can **predict** as they weigh a bag of sugar and a packet of serviettes. Try weighing large light objects and small heavy objects so children do not always learn to associate weight with size.



Time.

Time needs to be measured using the children's own experiences. Very young children are usually not ready for learning to tell the time using clocks and other standard measures.

They need to develop 'the concept of time.'

A set of pictures showing regular daily events as children's first understanding of measuring time is useful even at the Day Care level.

This should show familiar routines e.g. waking up, breakfast, walking to School, etc.

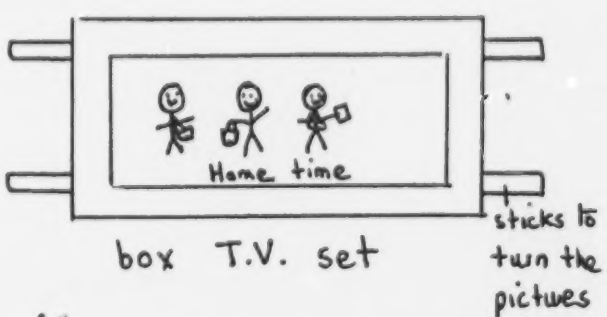
Sequencing and appropriate maths words can be used when looking at routines e.g.:- what do you do **first** in the morning.

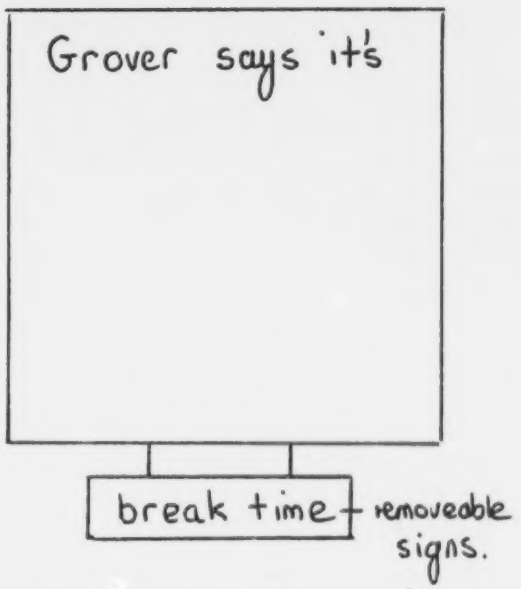
what do you do **next**, etc.

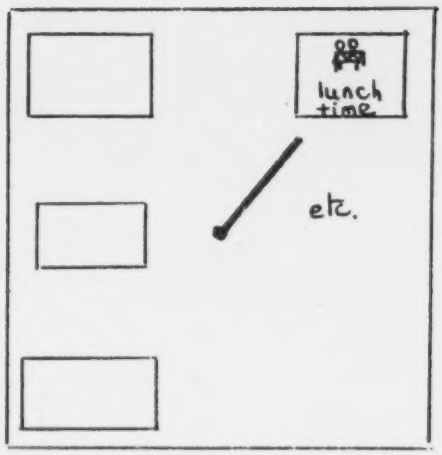
The routine of the Day Nursery and Preschool will help children to see the passing of time. Name each part of the session and verbalise this with the children.

e.g.:- circle time, snack/break time, home time, etc.

make appropriate visual aids, e.g.:-







Talk about the time as children take part in these routine activities e.g.:- "It is 10 o'clock, time for snack" etc..

If possible have a working clock at the children's height and refer to it at these times e.g. " It is 10 o'clock, see the small hand is on the ten, the big hand is on the twelve".

This is particularly useful for more mature preschool children. Have an old clock or a "junk" one made out of a paper plate in the Home area so the children can experiment by moving the hands.

Being familiar with the days of the week and months of the year also help children to know about the passage of time . **However, beware** as with learning numbers being able to chant "parrot fashion" Sunday to Saturday does not mean that a child understands the concept.

Time is a very difficult concept for young children to grasp and practical meaningful activities need to be thought of to help children to internalise this concept e.g.:-

- sprouting seeds.
-planning ahead for parties etc.
-talking about future events e.g. birthdays, holidays etc.
- talking about past events e.g. "What did you do in the holidays?"
- looking at family photographs with several generations.
- keeping record charts to build up a sense of time e.g.:- weather, birthdays, calender etc.

Money.

Children see money in daily use as a form of measurement.

- in going to the local shop to buy food.

- in role play with 'pretend' money in the Home or Shop area.

These are all good ways to experience the handling and use of money.

Toy coins can be made out of card or plastic and used in the dramatic or pretend play areas of the Hospital, Shop, Home, Block, Office areas, etc.

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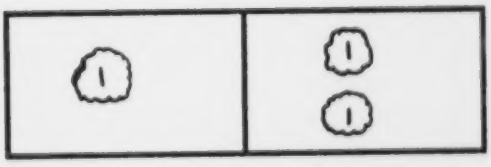
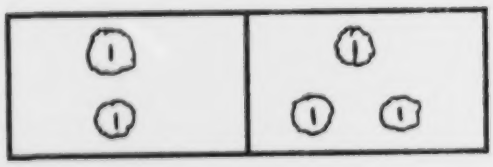
Young children will not need coins of any specific value, they are usually at the stage of understanding that one coin is for one thing, two for two things, etc.

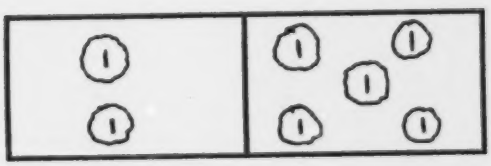
More mature children will enjoy identifying coins and a good activity is to take crayon rubbings of coins. 'Pretend' money can be made in this way with each coin cut out and stuck on thick card. It also becomes a good fine motor activity.

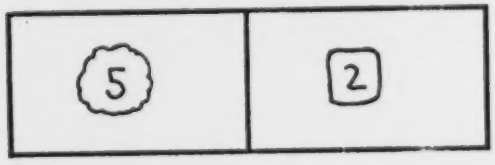
Money dominoes can also be made for older children who are beginning to understand the value of coins, e.g.:-





When children have reached the stage of understanding that one coin is worth maybe 5 or 10 cents a more complex set can be made. e.g.:-





Your Notes

4. SHAPE AND SPACE.

Children need to become familiar with many different **shapes**, not only in terms of circles, squares (as in geometric shapes) but the familiar objects around them toys, fruit, furniture, etc. as well as natural objects trees, flowers, leaves, etc.

To become really familiar with these shapes children need to be allowed to use their sense of touch as well as sight to explore them.

Feely boxes are good for this purpose, see 'Language and Learning' page 46.

A feely sock is also easy to make, see ECE Connection Newsletter October, 1995, page 1.

Special Interest tables with a variety of items can be set up for children to observe and experiment with. Encourage the children to bring in things of different sizes and textures and allow them to **touch and explore**. It could be 'Our Square table'.

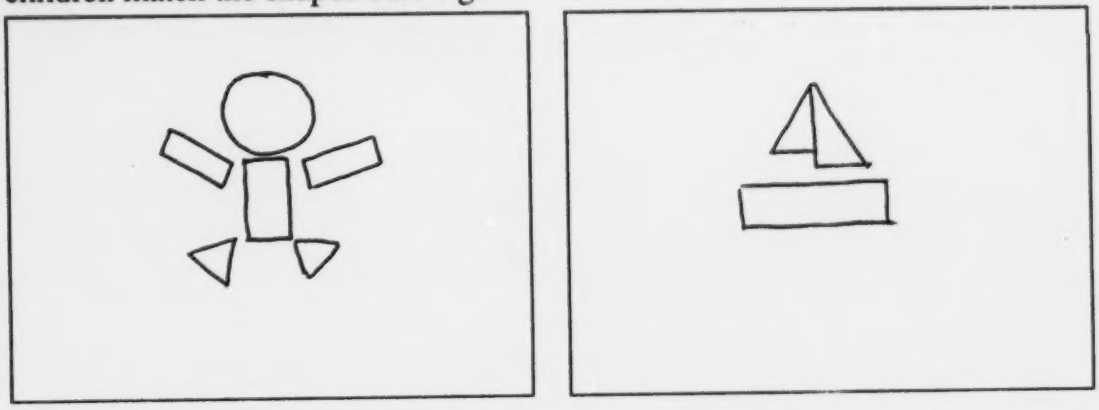
Provide shapes made out of thick card or cut from plastic lids for children to experiment with in picture and pattern making.

Children can learn that certain shapes put together can make another shape e.g.:-

Two squares make a rectangle,

Two triangles make a diamond, etc.

These shapes can also be used as a matching activity with base cards which the children match the shapes onto e.g.:-



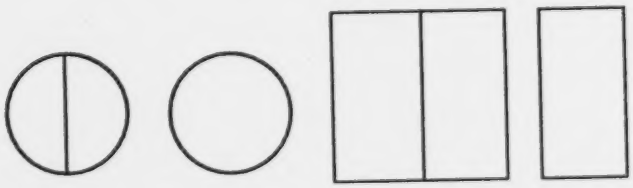
Posting boxes are good for recognizing shapes by putting them through the correct shaped hole. Home-made 'junk' ones can be made from oatmeal porridge boxes with the shapes cut out of the plastic lid e.g:-

lid

and used with small blocks.

Drawing and Painting

Children can be given pieces of shaped paper to experiment with .They will soon realise that some shapes folded on the axis of symmetry will become another shape e.g. a circle becomes a semi circle, a square a rectangle.



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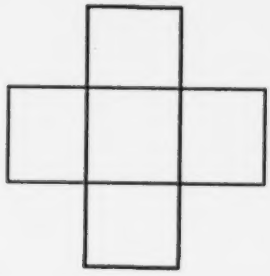
Concepts of symmetry can also be explored in natural objects e.g. shells:-

Children also explore symmetry as they complete a complex block building e.g.:-



Children can also learn a lot about symmetry in the craft area e.g.:-

- cutting out a heart for Valentine's day

- a fish for an underwater collage

- a rabbit for an Easter theme

Printing.

Printing is a good activity for using shapes either with wooden pieces or shapes cut out of sponge, styrofoam, potatoes, etc.

Games such as shape lotto, snap, dominoes, concentration, etc. are another good way for children to recognize, match and learn to identify and name geometric shapes.

Children can become aware of how shapes may change by using dough or plasticine. By experimenting with this type of material children learn that however much a piece of dough is rolled, squashed or squeezed into different shapes the actual quantity stays the same.

Children can also see repeated shapes in impressions in the sand or clay.

Children will enjoy making shapes with their own bodies during Music and Movement sessions, also with other children e.g. when playing circle games 'There's a brown girl in the ring.'

Outdoors.

A shape walk will encourage children's powers of observation as they look for e.g. squares or rectangles in the classroom, in the Primary School, the Shop, Office or Church building.

Children begin to learn about the concept of **space** at a very early age. As soon as they begin to move around they become aware of their relationship to other objects around them.

The **exploration** of space is important for young children. This takes place mainly in outdoor activities e.g. climbing, crawling, walking, sliding, etc.

Games such as catching and throwing with balls, bean bags and hoops help children to learn to estimate direction, distance and spaces between people and objects.

Bubble blowing and kite flying are a good fun way to learn about the space above.

Blocks.

At the early stages of block play children like to carry them around and pile them on top of each other.

Gradually they will begin to make roads and bridges. They are learning about balance and how things fit into certain spaces.

Small figures such as people,animals, cars, etc., available for use with the blocks help children to think about space when they make beds, pens, houses, garages for them to fit in.

Larger blocks allow children to make structures that they can fit in themselves. Young children often enjoy seeing how small a space they can fit inside or how many children can fit inside a certain space.

This discovery of spaces within shapes can also be a good group activity e.g.:-

- draw a chalk circle on the floor and count how many children can fit inside it. Can you fit more in standing or sitting? Let the children help you draw the results on a chart.

- draw several different sized circles, how many children can you fit inside?, how many large blocks?, how many chairs? Make a graph of the findings.

Discovering the concept of area can be achieved by covering surfaces like the sand pit or a large piece of card from a box with leaves, shells, seed pods, etc.

Discover the space of shapes by:-

- painting cardboard boxes.
- creating outlines and letting the children fill them in with crayons, paint or collage.
- providing bags and cases in the Home/Shop area and letting children fill them with suitable objects e.g. boxes.
- filling boxes or containers with large and small objects e.g. shells, leaves, etc. Count them and see how many it took to fill them, make a graph about it.

Your Notes

5. PATTERNING.

Patterning can be found in many areas of the Curriculum, for example music and language and in many instances in the natural environment.

Show children the patterns all around them e.g. wrapping paper, fabric, wallpaper, curtains and clothes with maybe spots, stripes, checks, etc.

- on bricks, tiles, fences, paths, etc.
- in nature on trees, shrubs, plants, flowers, seeds, fruit, etc.
    - on the outer skin of a breadfruit.
    - the veins of a large leaf.
    - the arrangement of a flower's petals.
    - the positioning of leaves on a branch.
    - the arrangement of segments and seeds in fruit e.g. soursop, orange, cucumber, etc.

Help the children to relate these patterns to ones in e.g.:-

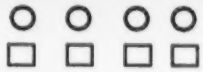
number - 2 4 6 8 etc.

shape - □ △ □ △ etc.

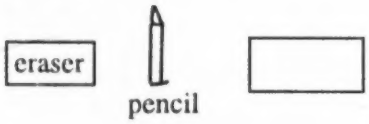
Children's exploration and pattern making can be encouraged by providing materials for them like small coloured blocks, bottle tops, shapes cut from thick card or plastic lids, cut down chubby or other plastic bottles, egg boxes, etc.

Initially they can be given the freedom to arrange them as they want, as they

mature in their Preschool years they can be encouraged to make repeat patterns you have suggested, or even make up their own patterns, e.g.:-



Patterns can also be made with familiar objects that you may find around your classroom e.g.:-



etc.

as well as natural objects e.g.:-

Cards can be made with a variety of patterns for the children to duplicate with the real objects, using natural materials, blocks, threading beads, etc.

Number steps as illustrated on page 21 also offer good practise for a 4+ group to use with many practical objects. These can be matched to the base card or if children are developmentally ready made independently with chalk numbers and bottle tops or blocks on the floor or with paper, crayons and counters on the table.

Printing also helps children to understand repeated patterns.
Games with patterns can be made from wrapping paper, drawn with crayons or with paper stuck inside bottle tops.

e.g.:- snap

Your Notes

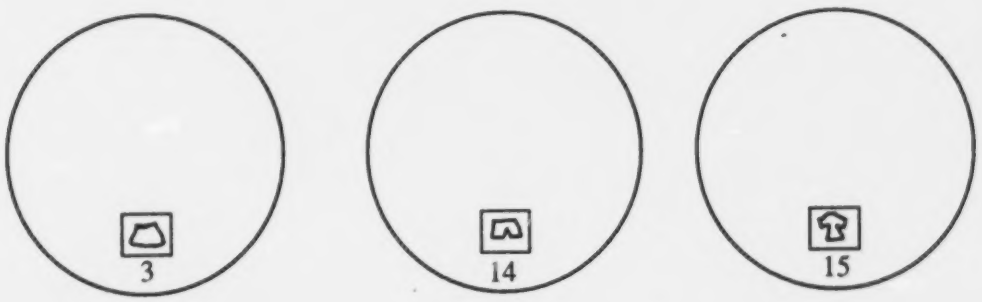
6. CHARTS, GRAPHS, MAPS.

Expressing ideas by means of the spoken word is the first and most important form of recording, **however, young children find ideas easier to understand if they are presented in a visual or preferably concrete way**.

Allowing children to sort themselves into groups according to a chosen criteria is fun. By the children themselves being bodily involved they are better able to understand the concepts involved e.g.:-

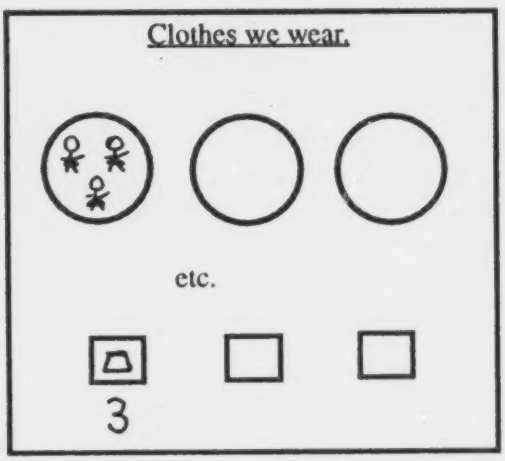
- draw the appropriate number of chalk circles on the floor, the children sort themselves into groups inside the circle according to e.g:-
    - lace up shoes, buckles, or velcro.
    - house sports colours.
    - uniform colours.
    - type of clothes e.g. dress, skirt, shorts.

Put a picture by each circle to help children e.g.:-



This activity can be extended with mature children by counting how many in each group, by comparing the numbers - which is larger, smaller. Introducing simple addition by counting all the groups together to receive a total.

This information can also be recorded in the form of a simple chart or graph e.g.:-



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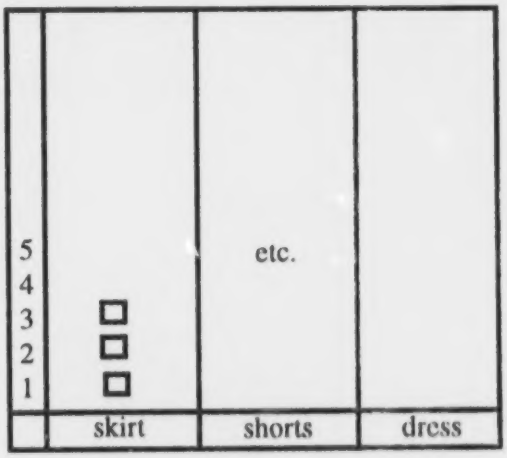
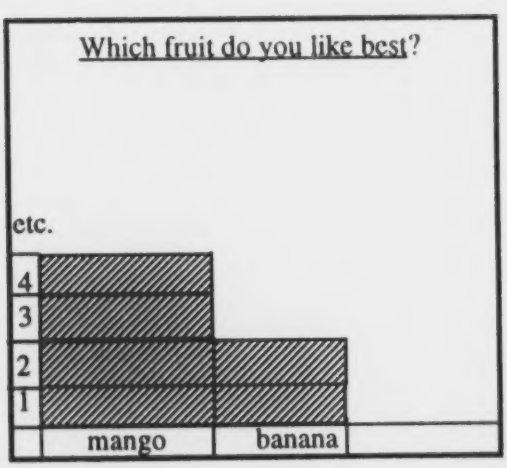


Surveys can also be carried out and recorded for e.g. birthdays, favourite fruit, vegetables, etc.

This can be recorded by a block graph, picture or happy face which the children can colour e.g.:-



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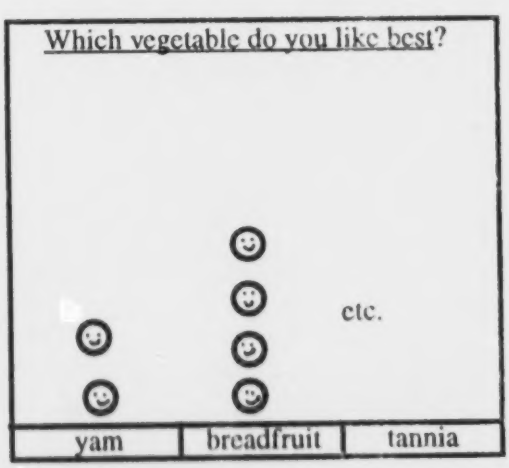
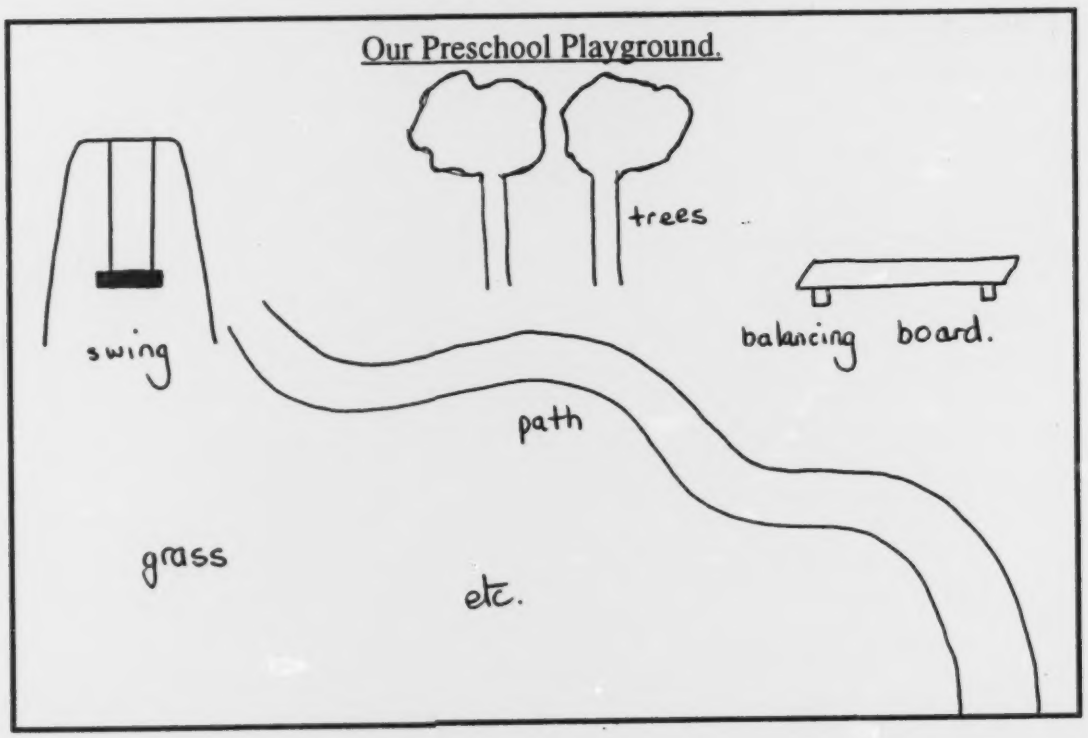


Maps are quite a sophisticated concept for young children to understand. However, they can be introduced to children in the form of maybe a plan of your outdoor play area drawn on Bristol board.

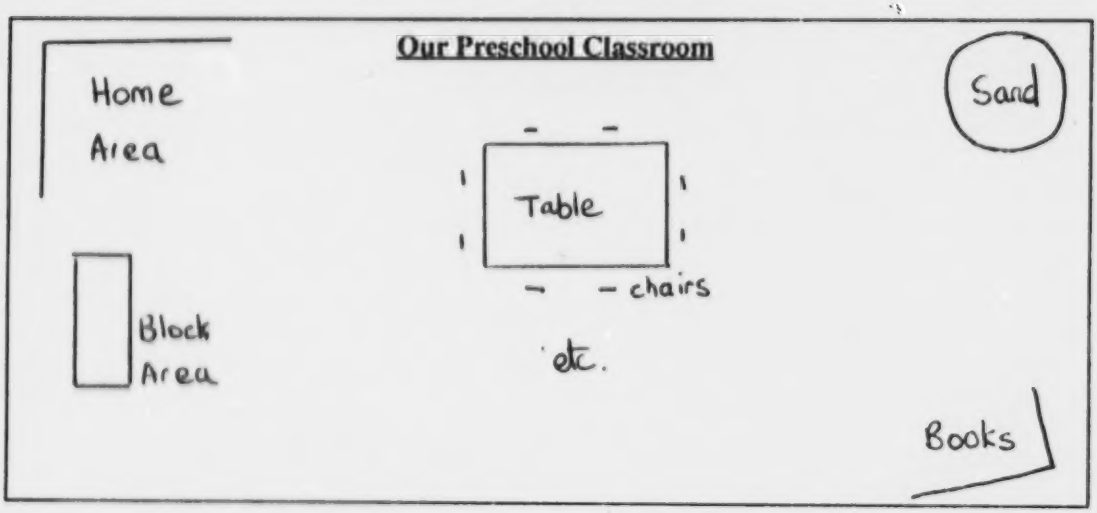
This can be a whole group activity,go outside and look at the area with the children, walk around the outside fence,name the pieces of equipment, count the number of trees, look at the shape of the path, where the gate is located, etc.

Draw the map with the children, have them draw, colour, paint or collage the various items. Label as much as possible. Display it at the children's eye level so they can refer to it.



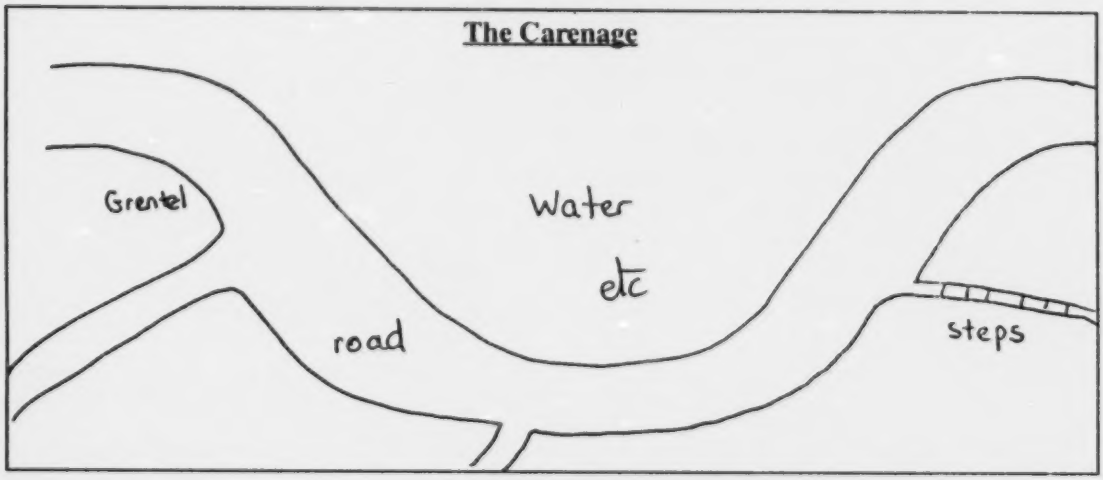
If possible take the children to a location where they can get an aerial view of your play area such as on a nearby hill or upstairs in the nearby Primary School building.

A map of your indoor area can also be made drawing and labelling the various areas.These will all help children's concept of space.



With the children's help you can draw maps of familiar routes e.g. Preschool to the shop.Walk it with the children first observing turns in the road, trees, landmarks you may want to add.

Maps can also be drawn with the children of familiar areas. The children can use these in the block area with small figures, vehicles, etc.



Section 6.

Maths and Science.

Maths and Science in the early years are very much concerned with finding out about things.

From the very beginning babies begin to explore and investigate, discovering about themselves and their world, how it is made, and how they can interact with it.

Babies learn about science from the earliest age - They discover about cause and effect as they learn they can make a noise by banging their rattle on the table, or discovering gravity as they repeatedly drop their spoon or toy on the floor.

Gradually as they mature they learn to observe and describe everyday events, to notice the sequences in which things occur and the effects of certain elements.

Science is essentially about discovery and experience and it is essential for this type of learning that 'hands on' or practical materials are provided for the children.

Much valuable learning can take place through the normal activities that are available at Day Care and Pre-Primary levels especially natural ones e.g. wet and dry sand,water, dough, plasticine, etc.

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Children will quite naturally learn through all their senses, they are as we know lively, active and 'into everything' ,learning how things look, sound, feel, taste and smell.

A range of sensory experiences allows children to learn the difference between solids and liquids, how different materials behave, about different textures, temperatures, weights,etc.

In the early years children need to be allowed to explore and discover initially for themselves.

A certain amount of freedom to **'make a mess'** allows children to feel comfortable, and removal of some clothes or provision of special hats, clothes or a special area outside will assist with this.

*** Talk about this with your parents and explain the educational benefits of children using these materials. e.g. sand,water,clay, paint, dough, etc.**

Although children need time and freedom to explore for themselves, our role as an adult can, as we have already mentioned enhance this process. **'Learning through play' needs to be planned and thought out.**

You as the educator need to be clear in your own mind what your aims are for the children.

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Try to avoid times when children are inactive or doing nothing, while you prepare or organise the next activity.

Sometimes this is unavoidable in a single teacher unit. However, children can always be learning with quiet activities e.g. books, paper and crayons.

Good planning and thought beforehand go a long way to avoid these situations, when discipline problems are often likely to occur.

Children need to be able to **verbalise** their discoveries and be helped to **explain, predict, compare, classify etc**.

Refer to the Language and Learning booklet pages 26 - 28 re questioning and modelling also.

As well as natural and everyday materials for science some specific equipment is very useful e.g. magnets, magnifying glasses, mirrors, torches, home made rain gauge and scales, (see page 30).

Most of the areas that are covered at the early stages in science are everyday topics that occur quite naturally as children play.

These can usually be incorporated with your current theme. You will probably find that you are covering other subject areas of the Curriculum and particularly overlapping maths and science. This is unavoidable and indeed the concept of an integrated theme is very appropriate for young children.

As we have already mentioned in the Language and Learning booklet page 16, young children do not naturally learn in compartments or subject areas but by absorbing, discovering and experiencing in what is called a 'whole learning' approach.

Special tables.

Special tables for science can take the form of discovery or investigation tables. The aim of these is to give children a chance to handle and explore the materials, whether it be a variety of rocks, magnets and associated equipment, magnifying glasses and a variety of interesting items, etc.

If table space is a problem in your Centre a large upturned cardboard box covered with a piece of material or a piece of board securely balanced over two blocks can be used. Make the area as attractive as possible with relevant posters, pictures, charts, books, chairs, cushions etc.

There are a number of skill areas and topics that can be looked at in your early science programme

e.g:-
- **Ourselves**
- **Senses**
- **Nature, living things - plants and animals**
- **Weather, seasons**
- **Our Earth and Universe, moon, sun, stars, etc.**
- **Natural and man made materials**
- **Food**

- **Water, sand, dough, plasticine, etc.**
- **Machines and tools**
- **Sources of power, water, wind, electricity, etc.**
- **Mirrors, light, shadows, rainbows, etc.**
- **Heat, air.**
- **Scales, balances, rain gauges, etc.**
- **Magnets**
- **Magnifying glasses**

One of these is discussed in a little more detail below:-

Science topic - Ourselves.

A topic on ourselves could cover many different areas, e.g.:-

Songs and rhymes.

Naming body parts e.g - Heads, shoulders, knees and toes.
Ten little Indian boys and girls.

A guessing game e.g.:- Show me your ankle,
Point to your partner's shoulder, etc.

Music and movement.

Exploring how their bodies move:-

Teach action words by the children doing the action

e.g. rolling, sliding, hopping, tip-toeing, curling up, etc.

Negotiating an obstacle course of boxes and tyres outside.

Health.

Discovering good food, health and exercise:-

Cooking can be incorporated here with food examined, prepared and tasted both raw and cooked.

Food can be served that is sticky, sweet, wet, cold, hot, etc.

Food can be served that has a different texture and/or taste in a different state e.g.:-

- boiled and roasted breadfruit.
- uncooked and cooked green peas, etc.

You can discuss how food affects our bodies and its growth, etc.

Hygiene can be emphasised with a practical component of a bowl of water with clothes or a doll to wash. This can also be incorporated as part of your water play.

A small line can be set up to peg the clothes out on (a good, fine motor activity). Two lines could be set up in different locations e.g. - one in the sun
- one in the shade

Help the children to see why one lot dries quicker than the other.

Children can look at their physical features and make a variety of charts and graphs about e.g.:-

- hair type, straight, curly, dark, light
- height

- weight
- age
- size of feet
- size of hands
- circumference of waist, head

Families can be looked at with photos, visits to homes or invitations to School.

Make books and illustrate with children's drawings about:-

- How we keep clean
- How we keep healthy
- My Family
- Our Preschool Class
- Our Preschool Day
- My baby sister (looking at routines, feeding, bathing, etc.)

Borrow the ECE Connection Curriculum kit - My Body, all about me from the Early Childhood Department of The Ministry of Education. There are some very useful items in it including mirrors, books, a body parts game, etc.

Think carefully about how you can use various areas of your early childhood environment for maths and science learning.

Outdoors.

- Try different types of walks, e.g. Shape, Colour, Size, Texture, Number.

- Excursions to see a house being built where the children may see Carpenters, Plumbers, Painters - mixing, sorting, measuring, etc.
- To the shop to see the shape, size and colour of goods. To look at labels and price tags and make some for your 'pretend' shop along with notices e.g. $3 a pound.

Free play outdoors allows children the opportunity to experience movements such as high and low, fast and slow, to understand spatial relationships as they move around objects, etc.

In a movement lesson ask children to move quickly or slowly, to jump high or low, between, beside, etc. Ask them to stretch tall, stoop low and make shapes with their bodies.

Make sounds experimenting with a variety of homemade instruments, see Language and Learning booklet pages 18-21. Tap, bang, scrape, shake, blow, pluck, flap, feel and move.

Pretend Play.

As children pretend that an object is something else e.g. a large box is a boat, they are using symbols. This is an important area as they use symbols later on in formal maths. In pretend play they also make choices and decisions, think and problem solve as well as using their imaginations and creative skills.

Blocks.

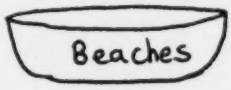
Props or practical equipment are a good stimulation for play both in the Home and Block areas.

Props can be interchanged to encourage play e.g. dressing up in the block area so children can pretend to go on a bus, etc. Some girls may be happier to play in the Block area if there are dolls to make beds for or boys alternatively have some blocks in the Home area to make cars for the dolls.

Some useful props to collect are:-

Large, strong cardboard boxes, old steering wheels, pieces of fabric and blanket, old cooking utensils, hats, bags, string, mats, pictures, clocks, junk e.g. cardboard rolls, boxes, etc.

Prop boxes or baskets can be made to bring out at different times, small enough for the children to move easily around both inside and out.

e.g. 

containing shells, hats, buckets, spades, etc.

Cooking.

Learning may take place under many subject headings when cooking e.g. maths, science, health, social skills, Language, etc., number, measurement, time, shape, space, patterning are all explored as children weigh, mix, stir, etc.

Collage.

Box collage or junk modelling encourage children to learn important skills e.g. about balance, solid shapes, solving problems, grouping, classifying, etc.

This record of achievements chart may be helpful for Pre-Primary teachers to use along with the Ministry of Education assessment sheets.

MATHS AND SCIENCE

CAROLINE MATUSIAK

Makes patterns with bricks, beads boxes etc.	Has experienced measuring for height, weight and length.	Chooses to sort and match objects with a common feature.	Willing to record through modelling painting, movement etc.	Has a caring attitude to others and the world.	
Knows a number rhyme	Counts to 5 1 Matching 1-to-1 2 Uses number names	Writes number of objects to 5 1. Picture 2. Tally 3. Number.	Can describe parts of the body.	Has planted seeds and watched them grow.	Enjoys observing and has used a magnifying glass
Knows that money is used when shopping	Names colours including:	Enjoys physical play: climbing, balancing, running, hopping and wheeled toys Can replace equipment and geometric blocks on to their silhouettes.	Names shapes including:	Willing to work with others	Enjoys looking after plants, animals and insects. Can plan and complete an activity.
Willing to talk about what s/he is doing, seeing, hearing, touching, tasting and smelling.	Willing to guess what might happen and test it.				
Chooses junk modelling and uses materials of a variety of shape, size and texture.	Chooses construction. Makes towers, walls and houses. Makes appropriate use of wheels.			Chooses water play. Experiments e.g. floating, sinking, displacement etc.	Chooses sand play. Experiments with wet and dry sand.
Talks about position, speed and direction	Describes how things are the same / different	Knows that clocks and watches mark time	Enjoys problem solving	Uses the word 'because' and reasons why Can relate photos and pictures to real objects. Enjoys fitting things together and taking them apart.	Repeats activity to see if it happens again Concentrates on chosen activity. Enjoys taking part in household activities
Asks questions, especially why?	Enjoys using clay and dough.	Willing to explore and experiment	Chooses food area activities		
Willing to tidy up and replace objects where they belong					Enjoys taking part in school activities.

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Acknowledgements are also made to the Preschool Playgroups Association in England for their valuable material, much of which was used in background reading.

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Other publications in this series include:

Maths and Science

1. A Practical Workbook for CXC Biology
2. Data Analysis Questions for Science Subjects. A Resource Booklet
3. Exercises and Activities in Basic Number Work
4. Fractions. Activities and Exercises for Teaching Fractions in Secondary Schools
5. Lower School Maths. Lesson Plans and Activities for Ages 7 -9 Years.
6. Maths and Science Booklet
7. Teaching Directed Numbers at Secondary School Level
8. Teachers' Resource Material for Integrated Science. Ideas for Teaching Integrated Science in Secondary Schools.
9. Upper School Maths Lesson Plans and Activities for Ages 9 -11 Years

Special Needs

10. An Introduction to Children with Special Needs for Teachers in Mainstream Education
11. The Alpha Centre: A Special School for Special Children. A Curriculum Checklist for Special Educational Needs.

English Language and Literacy

12. Language and Learning. A Practical Guide to Help with Planning your Early Childhood Programme.
13. Promoting Reading and Library Use in your School: A Resource Pack.
14. Strategies for Improving Language Across the Curriculum. Ideas and Activities for Every Classroom.
15. Your School Library. How it Works and How to Keep it Working.

Other

16. Beekeeping. A practical Guide to Beekeeping.
17. Caribbean Copy Art. A Resource Book for Teachers to Copy.
18. Methodology in Music Education.
19. Organising Workshops. A Practical Guide.

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